Exemption No. 11157

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20591

In the matter of the petition of

**SLUGWEAR, INC., dba LIKEONATREE AERIAL**

for an exemption from Part 21, Subpart H; and §§ 45.23, 45.29, 91.9, 91.109, 91.119, 91.121, 91.151, 91.203(a) and (b); and 91.401-417 of Title 14, Code of Federal Regulations

**Regulatory Docket No. FAA-2014-0534**

## GRANT OF EXEMPTION

By letter dated July 29, 2014, Mr. D. Douglas Branch, President of Slugwear, Inc. doing business as (dba) Likeonatree Aerial (hereinafter Petitioner or Operator), P.O. Box 16492, Seattle, WA 98116 petitioned the Federal Aviation Administration (FAA) for an exemption from part 21, subpart H; and §§ 45.23, 45.29, 91.9, 91.109, 91.119, 91.121, 91.151, 91.203(a) and (b), and 91.401-417 of Title 14, Code of Federal Regulations (14 CFR). The petitioner also asked for an exemption from FAA Notice 8900.227 Unmanned Aircraft Systems (UAS) Operational Approval, paragraphs 16(c)(4) and 16(e)(1). The proposed exemption would allow the petitioner to operate the DJI Phantom 2 quad-copter unmanned aircraft system (UAS) to conduct aerial photography and survey for various industries.

**The petitioner requests relief from the following regulations:**

Part 21 prescribes the procedural requirements for issuing and changing design approvals, productions approvals, airworthiness certificates, and airworthiness approvals.

Section 45.23(b) prescribes that when marks include only the Roman capital letter “N” and the registration number is displayed on limited, restricted or light-sport category aircraft or

experimental or provisionally certificated aircraft, the operator must also display on that aircraft near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches nor more than 6 inches high, the words “limited,” “restricted,” “light-sport,” “experimental,” or “provisional,” as applicable.

Section 45.29(b)(iii) prescribes, in pertinent part, that marks at least 3 inches high may be displayed on an aircraft for which the FAA has issued an experimental certificate under §21.191(d), § 21.191 (g), or § 21.191(i) of this chapter to operate as an exhibition aircraft, an amateur-built aircraft, or a light-sport aircraft when the maximum cruising speed of the aircraft does not exceed 180 knots calibrated airspeed.

Section 91.9(b)(2) prohibits operation of U.S.-registered civil aircraft unless there is available in the aircraft a current approved Airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

Section 91.109(a) prescribes, in pertinent part, that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

Section 91.119 prescribes that, except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

(a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

(b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

(c) Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

(d) Helicopters, powered parachutes, and weight-shift-control aircraft. If the operation is conducted without hazard to persons or property on the surface—

(1) A helicopter may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section, provided each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA; and

(2) A powered parachute or weight-shift-control aircraft may be operated at less than the minimums prescribed in paragraph (c) of this section.

Section 91.121 requires, in pertinent part, each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "…to the elevation of the departure airport or an appropriate altimeter setting available before departure."

Section 91.151(a) prescribes that no person may begin a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed, (1) during the day, to fly after that for at least 30 minutes [emphasis added].

Section 91.203(a) prohibits, in pertinent part, any person from operating a civil aircraft unless it has within it (1) an appropriate and current airworthiness certificate; and (2) an effective U.S. registration certificate issued to its owner or, for operation within the United States, the second copy of the Aircraft registration Application as provided for in § 47.31(c).

Section 91.203(b) prescribes, in pertinent part, that no person may operate a civil aircraft unless the airworthiness certificate or a special flight authorization issued under § 91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.

Section 91.405(a) requires, in pertinent part, that an aircraft operator or owner shall have that aircraft inspected as prescribed in subpart E of the same part and shall, between required inspections, except as provided in paragraph (c) of the same section, have discrepancies repaired as prescribed in part 43 of the chapter.

Section 91.407(a)(1) prohibits, in pertinent part, any person from operating an aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless it has been approved for return to service by a person authorized under § 43.7 of the same chapter.

Section 91.409(a)(2) prescribes, in pertinent part, that no person may operate an aircraft unless, within the preceding 12 calendar months, it has had an inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter.

Section 91.417(a) and (b) prescribes, in pertinent part, that—

> (a) Each registered owner or operator shall keep the following records for the periods specified in paragraph (b) of this section:
>
> (1) Records of the maintenance, preventive maintenance, and alteration and records of the 100-hour, annual, progressive, and other required or approved inspections, as appropriate, for each aircraft (including the airframe) and each engine, propeller, rotor, and appliance of an aircraft. The records must include—

(i) A description (or reference to data acceptable to the Administrator) of the work performed; and

(ii) The date of completion of the work performed; and

(iii) The signature, and certificate number of the person approving the aircraft for return to service.

(2) Records containing the following information:

(i) The total time in service of the airframe, each engine, each propeller, and each rotor.

(ii) The current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance.

(iii) The time since last overhaul of all items installed on the aircraft which are required to be overhauled on a specified time basis.

(iv) The current inspection status of the aircraft, including the time since the last inspection required by the inspection program under which the aircraft and its appliances are maintained.

(v) The current status of applicable airworthiness directives (AD) and safety directives including, for each, the method of compliance, the AD or safety directive number and revision date. If the AD or safety directive involves recurring action, the time and date when the next action is required.

(vi) Copies of the forms prescribed by § 43.9(d) of this chapter for each major alteration to the airframe and currently installed engines, rotors, propellers, and appliances.

(b) The owner or operator shall retain the following records for the periods prescribed:

(1) The records specified in paragraph (a)(1) of this section shall be retained until the work is repeated or superseded by other work or for 1 year after the work is performed.

(2) The records specified in paragraph (a)(2) of this section shall be retained and transferred with the aircraft at the time the aircraft is sold.

(3) A list of defects furnished to a registered owner or operator under

> § 43.11 of this chapter shall be retained until the defects are repaired and the aircraft is approved for return to service.

FAA Notice 8900.227, paragraph 16.c.(4), *PIC Medical*, states that the PIC must maintain, at a minimum, a valid FAA second-class medical certificate issued under 14 CFR part 67, Medical Standards and Certification, or the FAA-recognized equivalent.

Paragraph 16.e.(1), *Medical*, states that all observers must have a valid FAA second-class medical certificate issued under part 67; an FAA-recognized equivalent is an acceptable means of demonstrating compliance with this requirement.

The FAA notes that the notice referenced above is now incorporated into FAA Order 8900.1, Volume 16.

**The petitioner supports its request with the following information:**

The petition and the following supporting documentation are hereinafter referred to as the operating documents:

1) Supplemental Response for Petition,
2) Likeonatree Aerial UAS Operations Manual,
3) Phantom 2 User Manual v1.2

The petitioner submitted additional information in response to FAA requests, which are posted to the docket. The FAA has organized the petitioner's information into four sections: 1) the unmanned aircraft system (UAS), 2) the UAS pilot in command (PIC), 3) the UAS operating parameters and 4) public interest.

Unmanned Aircraft System

The petitioner states it plans to operate a UAS, the Phantom 2, which is comprised of an unmanned aircraft (UA or Phantom) and a transportable ground station. The UA is referred to as a quad-copter with a maximum gross weight of about 3 pounds. It is equipped with four rotors that are driven by electric motors powered by batteries. The UA has a maximum airspeed of 30 knots. The petitioner plans to use the UA with an attached camera to conduct aerial photography and survey various industries.

The petitioner states that given the size, weight, speed, and limited operating area associated with the aircraft to be utilized by it, an exemption from 14 CFR part 21, Subpart H (*Airworthiness Certificates*) and § 91.203(a) and (b) (*Certifications required*), subject to certain conditions and limitations, is warranted and meets the requirements for an equivalent level of safety under 14 CFR part 11 and Section 333 of P.L. 112-95 (Section 333).

The petitioner requests an exemption from § 45.23 *Marking of the aircraft* and § 45.29 *Size of Marks* because its UA will not have a cabin, cockpit or pilot station on which to mark certain

words or phrases. Further, the petitioner states that two-inch lettering is difficult to place on such a small aircraft with dimensions smaller than the minimal lettering requirement. Regardless of this, the petitioner states that it will mark its UA in the largest possible lettering by placing the word "Experimental" on it as required by § 45.29(f) so that it will provide sufficiently identifiable should someone discover the aircraft on the ground.

The petitioner states that an exemption from §§ 91.401 – 91.417 *Maintenance, Preventive Maintenance, and Alterations* may be required and should be granted since it is their intention that the PIC perform maintenance and inspection of the UA and be the person authorized to approve the aircraft for return to service. The petitioner states that prior to every flight, the PIC will inspect the aircraft to ensure that it is in an airworthy condition and will perform and general maintenance procedures or replacement of items as outlined by the UA's manufacturer. The petitioner also states that under no circumstances will the UA be operated in a condition that is deemed, or suspected to be, unsafe. If such a determination is reached and the problem cannot be remedied to the satisfaction of the PIC, the UAS will not be operated until after consulting with the manufacturer or one of its authorized dealers to determine the necessary repairs. The petitioner has also included a pre-flight safety checklist which will be completed before each flight as outlined in its operating documents.

<u>UAS Pilot in Command (PIC)</u>

The petitioner states that the PIC will be an FAA licensed airman with at least a commercial pilot certificate or will be directly supervised by an FAA-certificated commercial airman.

The petitioner notes that the FAA licensed airman will be considered PIC, whether flying or supervising and will be responsible for safe operations of the flight.

In addition to the PIC, the petitioner states the minimum crew for each operation will consist of the UAS PIC and an observer will be utilized if the UA will be flown beyond visual line of sight (BVLOS) of the PIC. The observer, if required and PIC will at all times be able to communicate by voice and/or text.

Regarding UAS operational training, the petitioner states the UA pilot will be trained in advance for the safe operation of the UAS to be operated. Said training will include a minimum of 100 takeoff/landing cycles, 25 hours of total time as a UAS rotorcraft pilot and at least 10 hours logged as a UAS pilot with a similar UAS type. Prior to operations the PIC must have accumulated and logged a minimum of 5 hours as UAS pilot operating the make and model of UAS as well as 3 takeoffs and landings in the proceeding 90 days. Specific training will include normal and emergency modes of operation and will include familiarization with the operation manual published by the UAS manufacturer. Training will also include types of maneuvers to be performed during operations including safe operation in relation to persons, property and applicable airspace.

Lastly the petitioner states that the PIC will establish a working relationship with a representative at the local Flight Standards district Office (FSDO) with which to annually review safety procedures and other operations to further enhance safety.

UAS Operating Parameters

The petitioner states that it will abide by the following additional operating conditions under this exemption:

- Safety will be the first and foremost consideration in the UAS operation
- Flight will be operated in Class G airspace whenever possible. If operation in other airspace is required, the relevant controlling agency will be notified at least 24 hours prior to the operation and, if required, any necessary permission obtained.
- Flights will be operated under visibility and cloud clearance requirements equivalent to Visual Flight Rules (VFR).
- The UAS will at all times give way to any aircraft carrying persons.
- Prior to a UAS flight, an area of operation will be established. This area of operation will include a defined lateral and vertical area, where the UAS will operate. Safety procedures will be established for persons, property and applicable airspace within the area of operation.
- Flight planning will include flight completion with at least 20% battery power remaining as measured by the UAS or appropriate timing.
- The UAS will utilize GPS navigation, failsafe, return-to-home, and/or flight abort safety features, if equipped.
- A briefing will be conducted in regard to the planned UAS operations prior to operation at each new location. All personnel who will be performing duties within the boundaries of the area of operation will be present for this briefing.
- All required permissions and permits will be obtained from appropriate state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies.
- Written, to include electronic, and/or oral permission from the relevant property owners will be obtained prior to an operation.

The petitioner states that § 91.9(b)(2) requires an aircraft flight manual in the aircraft for review by the crew, however since there are no pilots on board the UA the flight manual would not be available for review by the crew. To obtain an equivalent level of safety, the petitioner proposes that a current, UAS operation manual or equivalent be available to the crew at the ground station anytime the aircraft is in, or preparing for, flight.

The petitioner requests an exemption from § 91.109 *Flight instruction; simulated instrument flight and certain flight test,* concerning the need for dual controls during flight training. The petitioner states that UAS do not currently have a set of fully functioning dual controls and

during training the pilot instructor could easily take over the controls from the pilot being trained if the need arose – similar to the technique used with "throw-over-type" control wheels in some fixed wing aircraft. The petitioner states this would provide an equivalent level of safety.

The petitioner states that § 91.119 (c) provides that aircraft cannot operate closer than 500 feet to any person, vessel, vehicle or structure over sparsely populated areas. The petitioner indicates that the typical mission of this UAS would be photography or survey of persons, vessels, vehicles or structures and thus it would be necessary to operate closer than 500 feet to the items listed. However, since the petitioner has committed to receiving prior permission to fly over property or person, that this along with careful preplanning, the slow speed of the UA and its smaller mass would maintain an equivalent level of safety.

The petitioner indicates that § 91.121 *Altimeter settings* should be granted because the UA will normally be flying close to the ground and in line of sight of the PIC or an observer. The petitioner states that this line of sight operation will provide separation from other aircraft, obstructions and terrain, and would override the use of an altimeter for such purpose and thus an equivalent level of safety would be achieved if an exemption was granted.

The Petitioner requests an exemption from § 91.151(a) *Fuel requirements for flight in VFR conditions*, indicating that the purpose of the regulation was to provide a reasonable reserve of energy (fuel) to plan for a safe landing should there be a delay in landing. However, as previously indicated petitioner commits to concluding every flight with 20% battery power remaining and believes this would provide an equivalent level of safety.

Lastly, the petitioner requests an exemption from FAA Notice 8900.227 requiring the PIC and observer to have a valid FAA second-class medical certificate issued under part 67 stating that it is an unnecessary burden. Instead the petitioner proposes that the minimum medical requirements for both the PIC and observer be vision correct to 20/20 and a valid, state-issued driver's license. The petitioner states that an equivalent level of safety would be maintained under these conditions since the risk of the PIC and observer becoming incapacitated at the same time is very low, the UAS is operated low to the ground so it could land quickly if incapacitation was suspected and most UAS have an automatic return-to-home feature if needed.

Public Interest

The petitioner states that operation of a UAS would provide significant safety, environmental and other enhancements not possible by larger sized aircraft. The petition further states that operation of the UAS will provide a beneficial and currently unavailable service to government organizations and the general public that would serve the public interest.

**Discussion of Public Comments:**

A summary of the petition was published in the Federal Register on August 22, 2014 (79 FR 49831). The petition received one comment from the Air Line Pilots Association, International (ALPA) on the following topics: reliability and safety of operation of a UAS, lack of an airworthiness certificate, lost link, qualifications of the flight instructor, "see and avoid" requirements, medical certification of the PIC and control of the airspace in which the UAS operates.

ALPA expressed concern regarding reliability, safety and operation of UAS including petitioner's discussion about flying the UAS beyond line of sight as well as the use of a visual observer only when operating the UA beyond line of sight. The FAA shares these concerns and has incorporated associated conditions and limitations into this exemption, including: a) limiting operations within visual line of sight and b) requiring a visual observer for all operations. Further detail is contained in the analysis of the UAS below.

ALPA also specifically opposed petitioner's request for an exemption under Part 21, subpart H and 14 CFR § 91.203 which requires an airworthiness certificate prior to flight. As discussed in greater detail below, Section 333 of the FAA Modernization and Reform Act of 2012 authorizes the Secretary of Transportation to determine, considering a number of factors laid out in statute, that an airworthiness certificate is not necessary for certain operations. The Secretary has made that determination in this case and therefore the aircraft operated by the petitioner will not need to be certificated by the FAA.

Next, ALPA stated that lost link failures are the most common failures of a UAS and that mitigations must be required in order to prevent fly-aways or other scenarios. These mitigations should include auto-hover, auto-land, return-to-home and Geo-Fencing boundary protection. The FAA agrees and carefully examined the proposed operation to ensure that the vehicle design and the petitioner's supporting documentation addressed potential hazards related to C2 failure. The FAA finds that the UAS to be operated by the petitioner has sufficient design features to address these hazards. As discussed in the analysis of the UAS below, the Secretary of Transportation has determined that the UAS and associated operations proposed in the petition meet the criteria of Section 333 and thus design standards are not required. Further detail is contained in the analysis of the UAS below.

Fourth, ALPA stated that although petitioner asked for an exemption from § 91.109 *Flight instruction*, they failed to provide any information regarding the qualifications of the persons providing instruction per 14 CFR § 61.195 which defines the requirements for flight instructors. A certificated flight instructor is authorized to provide the instruction required for the certificates or ratings or currency listed in 14 CFR § 61.193. A person instructing on how to operate the UAS under the petitioner's training program would not need to be a certificated flight instructor because the instruction is not being provided for a certificate or rating listed in § 61.193. We note that none of the UAS operations proposed by the petitioner require such

flight instruction because § 61.31(*l*) allows for operation of the UAS by an airman who is current per 14 CFR § 61.56 without a category and class rating. Of course, any instruction provided toward obtaining the pilot certificate required by this exemption would need to be provided by a certificated flight instructor.

Regarding 14 CFR 91.113 Right of Way, "See and Avoid" requirements, ALPA also stated that given the absence of an onboard pilot, a means to meet this significantly complex requirement must be specified. The FAA shares these concerns and has incorporated associated conditions and limitations into this exemption, including: a) NOTAMs issued for all operations, b) operations conducted within VLOS of the PIC and the VO, and c) the UAS PIC must always yield right-of-way to manned aircraft.

Sixth, ALPA raised the issue of the need to maintain the current requirement that a 2nd class FAA medical certificate be required for all commercial pilots operating an aircraft for compensation or hire which they felt should apply equally to UAS pilots. ALPA cited the lack of information in the petition about minimum qualifications for the person at the actual controls, how supervision is to be conducted, what the qualifications of the PIC must be and what criteria the supervising pilot would use to determine when to intervene in the interest of safety. The FAA has carefully reviewed the concerns expressed in these comments regarding knowledge, training, and medical certification. Additional details are available in the ensuing analysis of this issue with regards to 14 CFR part 61.

Lastly, ALPA raised a concern about control of the airspace during UAS operations and a means to alert other aircraft in the area of the UAS operation. The FAA addressed these concerns by adding operating conditions and limitations regarding operations in the proximity of airports. The UA may not operate within 5 nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart unless a letter of agreement with that airport's management is obtained, and the operation is conducted in accordance with a NOTAM as required by the operator's Certificate of Waiver or Authorization (COA). Additionally, stand-off distance from clouds, altitude restrictions, and operating distance from non-participating personnel have been prescribed. Further detail is contained in the analysis of the UAS operating parameters below.

**The FAA's analysis is as follows:**

Unmanned Aircraft System (UAS)

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts.* In accordance with the statutory criteria provided in Section 333 of P.L. 112-95 in reference to 49 USC § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA

finds that the requested relief from 14 CFR part 21, and any associated noise certification and testing requirements of part 36, is not necessary.

Manned aircraft conducting photography and aerial surveying operations can weigh 5,000 lbs. or more and are operated by an onboard pilot, in addition to other crewmembers as necessary. The petitioner's UA weighs less than 3 lbs. The pilot and crew will be remotely located from the aircraft. The limited weight reduces the potential for harm to participating and nonparticipating persons or damage to property in the event of an incident or accident. The risk to an onboard pilot and crew during an incident or accident is eliminated with the use of a UAS for the proposed operation.

Manned aircraft are at risk of fuel spillage and fire in the event of an incident or accident. The UA carries no fuel, and therefore the risk of fire following an incident or accident due to fuel spillage is eliminated.

This exemption does not require an electronic means to monitor and communicate with other aircraft, such as transponders or sense and avoid technology. Rather the FAA is mitigating the risk of these operations by placing limits on altitude, requiring stand-off distance from clouds, permitting daytime operations only, and requiring that the UA be operated within VLOS and yield right of way to all manned operations. Additionally, the exemption provides that the operator will request a notice to airmen (NOTAM) prior to operations to alert other users of the NAS. These mitigations address concerns raised by ALPA regarding awareness of UAS operations occurring in the airspace.

The petitioner's UAS has the capability to operate safely after experiencing certain in-flight contingencies or failures and uses a failsafe mode to return to home and land when connection is lost. The UAS is also able to respond to a loss of GPS or a lost-link event with pre-coordinated automated flight maneuvers. The petitioner identified circumstances which could lead to loss of link including obstacles obstructing the signal between the remote control and the UA or interference causing a signal problem with the remote control. The FAA finds that these risk mitigations, in addition to the operating environment requirements included in this grant, adequately address lost-link (C2) concerns raised by ALPA.

Regarding the petitioner's requested relief from 14 CFR § 45.23(b), *Display of marks,* the petitioner's request is made under the assumption that marking with the word "experimental" will be required as a condition of an exemption request. However, this marking is reserved for aircraft that are issued experimental certificates under § 21.191. Since the petitioner's UAS will not be certificated under 14 CFR § 21.191, a grant of exemption for 14 CFR § 45.23(b) is not necessary.

The petitioner's UA must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part

45, Subpart C. Markings must be as large as practicable per § 45.29(f). Therefore a grant of exemption for § 45.29 is not necessary.

Regarding the petitioner's requested relief from §§ 91.401-417, the FAA has determined that relief from the following sections is required: 14 CFR 91.405 (a*) Maintenance required, 91.407(a) (1) Operation after maintenance, preventive maintenance, rebuilding, or alteration, 91.409(a) (1) and (2) Inspections, and 91.417(a) and (b) Maintenance records.* The FAA has carefully evaluated the petitioner's request and determined that cause for granting the exemption is warranted. The FAA notes that the petitioner's operating documents contain preflight checks for the UAS. The FAA finds that adherence to the operating documents, as required by the conditions and limitations below, is sufficient to ensure that safety is not adversely affected. In accordance with the petitioner's UAS maintenance, inspection, and recordkeeping requirements, the FAA finds that exemption from 14 CFR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b) is warranted subject to the conditions and limitations below. These along with other conditions and limitations address reliability and safety concerns raised by ALPA.

<u>UAS Pilot In Command (PIC)</u>

Petitioner proposes operations beyond visual line of sight (BVLOS) with the support of a visual observer (VO). The analysis below will first address the proposal to conduct UA operations BVLOS, followed by an analysis of the PIC qualifications and medical requirements, and lastly, VO qualifications and medical requirements.

Though it proposed operations BVLOS, the petition did not provide data or analysis to demonstrate that operating BVLOS can be performed without adversely impacting safety. Section 333 of the PL 112-95 specifically requires that operations approved by the Secretary under Section 333 be conducted within VLOS and does not permit operations BVLOS. As in all previous grants of exemption (Exemptions Nos. 11062, 11063, 11064, 11065, 11066, 11067, 11080, 11109, 11110, 11111, 11112, 11114, 11136, 11138) in order to maintain an equivalent level of safety, the FAA requires operations be conducted within VLOS of the PIC, and in addition, requires a VO to assist the PIC with maintaining VLOS with the UA. Therefore the FAA will require the same in this petition. PIC and VO requirements in this exemption address the "see and avoid" concern raised by ALPA.

With regard to the qualifications and training necessary to operate the UAS, the petitioner has provided the following information regarding its minimum requirements: a minimum of 100 takeoff/landing cycles, 25 hours of total time as a UAS rotorcraft pilot and at least 10 hours logged as a UAS pilot with similar UAS type (single blade or multirotor). Petitioner further states that the PIC must have accumulated a minimum of 5 hours as UAS pilot operating the make and model of UAS to be utilized for operations under this exemption and three take-offs and landings in the proceeding 90 days. Specific training for the PIC is to include the use of the manufacturer's training manual (if provided), petitioner's operations manual including

checklists as well as familiarization with basic flight maneuvers including takeoff, landing, climbs, descents, turns, maneuvering around objects, awareness and avoidance of other air traffic, and safe operations around consenting personnel and avoidance of non-participating personnel.

The FAA finds that at a minimum, the flight-hour requirements provided by the petitioner are appropriate to practice and build proficiency in the skills necessary to safely conduct the petitioner's proposed operations. The FAA also finds that any prior documented flight experience obtained in compliance with these minimums would satisfy this requirement. Training, proficiency, and experience-building flights can also be conducted under the grant of exemption to accomplish the required flight time. During training, proficiency, and experience-building flights the PIC is required to operate the UA with appropriate distances in accordance with 14 CFR 91.119.

In addition to the minimum requirements proposed above, the petitioner may determine through a safety assessment of its proposed operations that additional hours are necessary to address all potential flight hazards and requisite airmanship skills. Therefore, as in Exemption No. 11136, (Advanced Aviation Solutions), the conditions and limitations below stipulate that the petitioner may not permit any PIC to operate the UAS unless that PIC is able to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures.

The petitioner has requested an exemption from FAA Notice 8900.227 *Unmanned Aircraft Systems (UAS) Operational Approval*, paragraph 16(c) (4) and 16(e) (1) which addresses PIC Medical and Observer Medical requirements and proposes medical qualifications including a valid, state-issued driver's license along with vision corrected to 20/20. ALPA commented that the petitioner should be required to meet the current Class II, FAA medical certificate requirement for a commercially rated airman.

Regarding medical certification, the FAA does not grant exemptions from its Orders such as 8900.227. Second, 14 CFR § 61.23(a)(2)(ii) requires airman excising the privileges of a commercial certificate must possess a current second class medical certificate. Therefore, the FAA finds that the PIC must hold a commercial airman certificate and a current second class medical certificate. This addresses the PIC's medical certification issue raised by ALPA. Medical certification of the VO is addressed below.

In conclusion, the FAA finds that prior to operations any PIC must, at a minimum, hold a commercial pilot certificate, a second class medical certificate, and complete the minimum flight hour and currency requirements as stated in the conditions and limitations below.

As discussed above, all flights will be operated within VLOS of the PIC and VO. The conditions and limitations below stipulate that the PIC must ensure that the VO can perform

the functions prescribed in the operating documents. Additionally, as discussed in Exemption No. 11109 to Clayco, Inc., there are no regulatory requirements for VO medical certificates. Although a medical certificate is not required for a VO, the UA must never be operated beyond the actual visual capabilities of the VO, and the VO and PIC must have the ability to maintain VLOS with the UA at all times. It is the responsibility of the PIC to be aware of the VO's visual limitations and limit operations of the UA to distances within the visual capabilities of both the PIC and VO. Moreover, the VO will not be operating the aircraft. Therefore, as in Grant of Exemption No. 11062 to Astraeus, the FAA does not consider a medical certificate necessary for the VO.

Operating parameters of the UAS

Although the petitioner did not request relief from 14 CFR § 91.7(a) *Civil aircraft airworthiness,* the FAA finds that relief from § 91.7(a) is necessary. While the petitioner's UAS will not require an airworthiness certificate in accordance with 14 CFR part 21, Subpart H, the FAA considers the petitioner's compliance with its operating documents to be a sufficient means for determining an airworthy condition. Therefore, relief from § 91.7(a) is granted. The petitioner is still required to ensure that its aircraft is in an airworthy condition – based on compliance with the operating documents prior to every flight, and as stated in the conditions and limitations below.

Additionally, in accordance with 14 CFR § 91.7(b), the PIC of the UAS is responsible for determining whether the aircraft is in a condition for safe flight. The FAA finds that the PIC can comply with this requirement, therefore relief from § 91.7(b) is not necessary.

Regarding the petitioner's requested relief from 14 CFR § 91.9 *Civil aircraft flight manual, marking, and placard requirements* and 14 CFR § 91.203(a) and (b) *Civil aircraft: Certifications required,* the FAA has previously determined that relief from these sections is not necessary. Relevant materials may be kept in a location accessible to the PIC in compliance with the regulations.

Regarding the petitioner's requested relief from 14 CFR § 91.109 *Flight instruction; Simulated instrument flight and certain flight tests,* the petitioner did not describe training scenarios in which a dual set of controls would be utilized or required, i.e. dual flight instruction, provided by a flight instructor or other company-designated individual, that would require that individual to have fully functioning dual controls. Rather, the petitioner intends to accomplish training through the procedures referenced in the operating documents. Furthermore, the petitioner has indicated their PIC will possess at least a commercial pilot's certificate. Also, this exemption will require that training operations only be conducted during dedicated training sessions. The FAA finds safety will not be adversely impacted if the petitioner follows the training outlined in the operating documents. As such, the FAA finds that the petitioner can conduct its operations without the requested relief from § 91.109. This addresses ALPAs concern about § 91.109.

The petitioner's requested relief from 14 CFR § 91.119, *Minimum safe altitudes.* Relief from § 91.119(a), which requires operating at an altitude that allows a safe emergency landing if a power unit fails, is not granted. The FAA expects the petitioner to be able to perform an emergency landing without undue hazard to persons or property on the surface if a power unit fails. Relief from § 91.119(b), operation over congested areas, is not applicable, because the petitioner states that operations will only be conducted "in Class G airspace, whenever possible" and it will secure "written, to include electronic, and/or oral permission from the relevant property owners prior to operations." The petitioner also states that an area of operations will be established before flight with defined lateral and vertical areas with safety procedures established for person, property and applicable airspace within the area of operations. Thus no operations will be conducted over congested areas.

Relief from § 91.119(c) is necessary because the aircraft will be operated at altitudes below 400 feet AGL. Section 91.119(c) states that no person may operate an aircraft below the following altitudes: over other than congested areas, an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. The petitioner states that it will operate pursuant to the following:

1. at or below 250 feet AGL based on the home point,
2. within a radius of 750 feet based upon the home point,
3. notification of the appropriate agency if the operation altitude of 250 feet AGL (as noted above) will be within the boundaries of Class B, C, D or E airspace,
4. flown in GPS mode and within flight limits set in the UA's autopilot system to the values stated in 1 and 2 above,
5. flight in proximity and speed that would not create a hazard to person and property, and
6. with the permission of the property owner.

The petitioner did not describe specific minimum stand-off distances from persons, vessels, vehicles and structures. Section 91.119(c) requires that aircraft operate no closer than 500 feet to these persons or objects. As discussed in Exemption No. 11109 to Clayco, Inc. (*see* Docket No. FAA-2014-0507), operations conducted closer than 500 feet to the ground may require that the UA be operated closer than 500 feet to essential persons, or objects that would not be possible without additional relief. Therefore, the FAA is requiring that prior to conducting UAS operations, all persons not essential to flight operations (nonparticipating persons) must remain at appropriate distances. In open areas this requires the UA to remain 500 feet from all persons other than essential flight personnel (i.e. PIC, VO, operator trainees or essential persons).

The FAA has also considered that the UA will weigh about 3 pounds. If barriers or structures are present that can sufficiently protect nonparticipating persons from the UA or debris in the event of an accident, then the UA may operate closer than 500 feet to persons afforded such

protection. The operator must also ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately. When considering how to immediately cease operations, the primary concern is the safety of those nonparticipating persons. In addition, the FAA finds that operations may be conducted closer than 500 feet to vessels, vehicles and structures when the land owner/controller grants such permission and the PIC makes a safety assessment of the risk of operating closer to those objects and determines that it does not present an undue hazard.

The petitioner proposed notifying the appropriate agency if the operation of the UAS will be within the boundaries of Class B, C, D or E airspace. The FAA Air Traffic Organization reviews all proposed UAS operations and evaluates the safety of these operations relative to the requested airspace through the existing COA process. The majority of current UAS operations occurring in the NAS are being coordinated through ATC by the issuance of a COA. This process not only makes local ATC facilities aware of UAS operations, but also provides ATC the ability to consider airspace issues that are unique to UAS operations. The COA will require the operator to request a NOTAM, which is the mechanism for alerting other users of the NAS to the UAS activities being conducted. The conditions and limitations below prescribe the requirement for the petitioner to obtain an ATO-issued COA.

Thus, the FAA finds that relief from § 91.119(c) is warranted provided adherence to the procedures in the operating documents and the FAA's additional conditions and limitations outlined below.

Regarding the petitioner's requested relief from 14 CFR § 91.121 *Altimeter Settings*, the petitioner has a barometric altimeter and GPS derived altitude capabilities. However, as stated in the conditions and limitations below, the FAA requires any altitude reported to ATC to be in feet AGL. The petitioner may choose to set the altimeter to zero feet AGL rather than local barometric pressure or field altitude before flight. Considering the limited altitude of the proposed operations, relief from 14 CFR 91.121 is granted to the extent necessary to comply with the applicable conditions and limitations stated below.

Regarding the petitioner's requested relief from § 91.151 (a) *Fuel requirements for flight in VFR conditions*, prior relief has been granted for manned aircraft to operate at less than prescribed minimums, including Exemption Nos. 2689, 5745, and 10650. In addition, similar UAS-specific relief has been granted in Exemption Nos. 8811, 10808, and 10673 for daytime, VFR conditions. The petitioner's only reference to this section is its commitment to land the UAS with 20% battery energy remaining. The operating documents indicate that two low-voltage (low battery) alerts are issued - warning that the first alert should be followed (30% - low battery level warning). Following the second alert with only 15% battery power remaining, the UA will begin to descend and land automatically. As in exemption No. 11138 (Douglas Trudeau), the FAA finds that these factors provide sufficient reason to grant the relief from 14 CFR § 91.151(a) as requested in accordance with the conditions and limitations

below following the manufacturer's recommendation. Thus, the PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 30% battery power remaining.

Regarding an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA), the majority of current UAS operations occurring in the NAS are being coordinated through Air Traffic Control (ATC) by the issuance of a COA. Although the petitioner indicates a COA and NOTAM should only be required if their UAS operates beyond visual line of sight, the COA and NOTAM requirement is an existing process that not only makes local ATC facilities aware of UAS operations, but also provides ATC the ability to consider airspace issues that are unique to UAS operations. The COA will require the operator to request a NOTAM, which is the mechanism for alerting other users of the NAS to the UAS activities being conducted. The conditions and limitations below prescribe the requirement for the petitioner to obtain an ATO-issued COA. This addresses a concern raised by ALPA.

Public Interest

The FAA finds that a grant of exemption is in the public interest. The enhanced safety and reduced environmental impact achieved using a UA with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest. The following table summarizes the FAA's determinations regarding the relief sought by the petitioner:

| Relief considered (14 CFR) | FAA determination (14 CFR) |
|---|---|
| Part 21, subpart H | Relief not necessary |
| 45.23(b) | Relief not necessary |
| 45.29 | Relief not necessary |
| 91.7(a) | Relief granted with conditions and limitations |
| 91.9(b)(2) | Relief not necessary |
| 91.109 | Relief not necessary |
| 91.119 | Paragraphs (a) and (b) relief are not granted; paragraph (c) relief granted with conditions and limitations; paragraph (d) relief is not warranted |
| 91.121 | Relief granted with conditions and limitations |
| 91.151(a) | Relief granted from § 91.151(a)(1), day, |

| Relief considered (14 CFR) | FAA determination (14 CFR) |
|---|---|
| | with conditions and limitations |
| 91.203(a) and (b) | Relief not necessary |
| 91.405(a) | Relief granted with conditions and limitations |
| 91.407(a)(1) | Relief granted with conditions and limitations |
| 91.409(a)(1) and (2) | Relief granted with conditions and limitations |
| 91.417(a) and (b) | Relief granted with conditions and limitations |

**The FAA's Decision**

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Slugwear, Inc. dba Likeonatree Aerial is granted an exemption from 14 CFR §§ 91.7 (a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b) to the extent necessary to allow the petitioner to operate an unmanned aircraft systems (UAS) for the purpose of aerial photography and survey for various industries. This exemption is subject to the conditions and limitations listed below.

**Conditions and Limitations**

Relative to this grant of exemption, Slugwear, Inc. dba Likeonatree Aerial is hereafter referred to as the operator.

The petition and the following supporting documentation are hereinafter referred to as the operating documents:

1) Supplemental Response for Petition,
2) UAS Operations Manual,
3) PHANTOM 2 User Manual v1.2

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1) Operations authorized by this grant of exemption are limited to the following aircraft described in the operating documents which is a quad-rotor aircraft weighing about 3 pounds: DJI Phantom 2 Unmanned Aircraft System. Proposed operations of any other aircraft will require a new petition or a petition to amend this grant.

2) UAS operations under this exemption are limited to conducting operations for the purpose of aerial photography and survey for various industries.

3) The UA may not be flown at an indicated airspeed exceeding 30 knots.

4) The UA must be operated at an altitude of no more than 250 feet above ground level (AGL), as indicated by the procedures specified in the operating documents. All altitudes reported to ATC must be in feet AGL.

5) The UA must be operated within visual line of sight (VLOS) of the pilot in command (PIC) at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate.

6) All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times. Electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the functions prescribed in the operating documents.

7) The VO must not perform any other duties beyond assisting the PIC with seeing and avoiding other air traffic and other ground based obstacles/obstructions and is not permitted to operate the camera or other instruments.

8) The operating documents and this grant of exemption must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS-80) may be contacted if questions arise regarding updates or revisions to the operating documents.

9) Prior to each flight, the PIC must inspect the UAS to ensure it is in a condition for safe flight. If the inspection reveals a condition that affects the safe operation of the UAS, the UAS is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight. The Ground Control Station must be included in the preflight inspection. All maintenance and alterations must be properly documented in the aircraft records.

10) Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, must undergo a functional test flight. The PIC who conducts the functional test flight must make an entry in the aircraft records.

11) The pre-flight inspection section in the operating documents must account for all potential discrepancies, e.g. inoperable components, items, or equipment, not already covered in the relevant sections of the operating documents.

12) The operator must follow the UAS manufacturer's aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements.

13) The operator must carry out its maintenance, inspections, and record keeping requirements, in accordance with the operating documents. Maintenance, inspection, alterations, and status of replacement/overhaul component parts must be noted in the aircraft records, including total time in service, description of work accomplished, and the signature of the authorized person returning the UAS to service.

14) Each UAS operated under this exemption must comply with all manufacturer Safety Bulletins.

15) The authorized person must make an entry in the aircraft record of the corrective action taken against discrepancies discovered between inspections.

16) The PIC must possess at least a commercial airman certificate and at least a current second class medical certificate. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

17) The operator may not permit any PIC to operate unless the PIC meets the operator's qualification criteria and demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). The VO is also required to complete the operator's training requirements. A record of training must be

documented and made available upon request by the Administrator. Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building), are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

18) The operator may not permit the PIC to operate the UAS for the purpose of aerial photography and survey for various industries (or similar operations), unless the PIC has demonstrated and logged in a manner consistent with 14 CFR § 61.51(b), the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from people, vessels, vehicles and structures.

19) UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized. Flights under special visual flight rules (SVFR) are not authorized.

20) The UA may not operate within 5 nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart unless a letter of agreement with that airport's management is obtained, and the operation is conducted in accordance with a NOTAM as required by the operator's COA. The letter of agreement with the airport management must be made available to the Administrator upon request.

21) The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

22) If the UA loses communications or loses its GPS signal, it must return to a pre-determined location within the planned operating area and land or be recovered in accordance with the operating documents.

23) The PIC must abort the flight in the event of unpredicted obstacles or emergencies in accordance with the operating documents.

24) The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 30% battery power remaining.

25) The operator must obtain an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA) prior to conducting any operations under this grant of

exemption. This COA will also require the operator to request a Notice to Airman (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation. All operations shall be conducted in accordance with airspace requirements in the ATO issued COA including class of airspace, altitude level and potential transponder requirements.

26) All operations shall be conducted in Class G airspace or as otherwise prescribed in the ATO issued COA.

27) All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

28) Before conducting operations, the radio frequency spectrum used for operation and control of the UA must comply with the Federal Communications Commission (FCC) or other appropriate government oversight agency requirements.

29) The documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the UAS is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

30) The UA must remain clear and yield the right of way to all manned aviation operations and activities at all times.

31) The UAS may not be operated by the PIC from any moving device or vehicle.

32) The UA may not be operated over congested or densely populated areas.

33) Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:

    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately and/or;

    b. The aircraft is operated near vessels, vehicles or structures where the owner/controller of such vessels, vehicles or structures has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard, and;

c. Operations nearer to the PIC, VO, operator trainees or essential persons do not present an undue hazard to those persons per § 91.119(a).

34) All operations shall be conducted over private or controlled-access property with permission from the land owner/controller or authorized representative. Permission from land owner/controller or authorized representative will be obtained for each flight to be conducted.

35) Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on January 31, 2017, unless sooner superseded or rescinded.

Issued in Washington, DC, on January 29, 2015.

/s/
John Barbagallo
Acting Deputy Director, Flight Standards Service